IN THE CLAIMS:

Listing of Claims

(Original) 1. A method for cleaving IAP, wherein the method comprises:

contacting *in vitro*, isolated IAP with an amount of an isolated Omi family polypeptide, whereby upon contact, the Omi family polypeptide will cleave the IAP.

(Original) 2. The method of Claim 1, wherein the IAP is selected from the group consisting of cIAP1, cIAP2, XIAP, Livin α, Livin β, and DIAP1.

(Original) 3. The method of Claim 1, wherein the Omi family polypeptide is selected from the group consisting of SEQ ID NOs. 44, 45, 48, 49, 54-57, 60-63, 66-75, and homologs thereof.

(Original) 4. The method of Claim 1, wherein the Omi family polypeptide to IAP molar ratio *in vitro* is equal to between 1:5 to 1:30 molar ratio of Omi to IAP.

(Original) 5. The method of Claim 1, wherein the Omi family polypeptide is expressed by a nucleic acid sequence molecule selected from the group consisting of SEQ ID NOs. 1-3, 6-8, 11-19, 22-27, and 30-39, and homologs thereof.

(Original) 6. The method of Claim 1, wherein the *in vitro* conditions incubation time is 2 hours at 37° C in solution.

(Original) 7. A method for cleaving IAP, wherein the method comprises:

(a) isolating a population of cells, whereby the caspase found in the cells is bound by IAP;

(b) contacting *in vitro* the isolated cell population with the Omi family polypeptide whereby upon contact, the Omi family polypeptide cleaves the IAP from the caspase.

(Original) 8. The method of Claim 7, wherein the Omi family polypeptide is selected from the group consisting of SEQ ID NOs. 44, 45, 48, 49, 54-57, 60-63, 66-75.

(Original) 9. The method of Claim 7, wherein the Omi family polypeptide is selected from the group consisting of Omi WT, OmiΔPDZ, OmiΔAVPS, Omi protease and Omi catalytic triad.

(Original) 10. The method of Claim 8, wherein the Omi family polypeptide is in a carrier.

(Original) 11. The method of Claim 10, wherein the carrier is a liposome.

(Original) 12. A method for cleaving IAP comprising:

(a) isolating and amplifying an Omi family member gene;

(b) forming an Omi expression construct from the isolated and amplified Omi family member gene;

(c) transfecting a cell population having caspase bound by IAP, with the Omi family member construct; and,

(d) causing expression of the Omi vector, whereby the OMI family polypeptide cleaves IAP.

(Original) 13. The method of Claim 12, wherein the Omi family polypeptide is expressed by a nucleic acid sequence molecule selected from the group consisting of SEQ ID NOs. 1-3, 6-8, 11-19, 22-27, and 30-39, and homologs thereof.

(Original) 14. The method of Claim 12, wherein expression is caused by the addition of etoposide.

(Original) 15. The method of Claim 12, wherein expression is caused by damage to the cell.

(Original) 16. A method for cleaving IAP, wherein the method comprises:

contacting isolated IAP with an amount of an isolated Omi family polypeptide, whereby upon contact, the Omi family polypeptide will cleave the IAP.

(Original) 17. A polypeptide for cleaving IAP selected from the group consisting of Omi WT, OmiΔPDZ, OmiΔAVPS, Omi protease, Omi catalytic triad, and homologs thereof.

(Original) 18. The polypeptide of Claim 17, comprising a carrier.

(Original) 19. The polypeptide of Claim 17, wherein the polypeptide is selected from the group consisting of expressed intra-cellular, isolated, or recombinant polypeptides.

(Original) 20. An isolated polypeptide for cleaving IAP selected from the group consisting of SEQ ID NOs. 44, 45, 48, 49, 54-57, 60-63, 66-75, and homologs thereof.

(Original) 21. A polypeptide for cleaving IAP comprising a protease domain selected from the group consisting of SEQ ID NOs. 64-66 and 75-80, and homologs thereof.

(Original) 22. A polypeptide having increased protease activity comprising a polypeptide selected from the group consisting of SEQ ID NOs. 48, 49, 55, 56, 57, 60-63, 66-75, and homologs thereof.

(Original) 23. A polypeptide for binding to a BIR site on an IAP, comprising SEQ ID NO. 77 and homologs thereof.

(Original) 24. A polypeptide for cleaving IAP comprising a polypeptide selected from the group consisting of SEQ ID NOs. 44 and 45, and homologs thereof.

(Original) 25. The polypeptide of Claim 24, wherein the Omi to IAP molar ratio *in vitro* is equal to between 1:5 to 1:30 molar ratio of Omi to IAP.

(Original) 26. A polypeptide which binds to IAP, but does not cleave IAP, selected from the group consisting of SEQ ID NOs. 46, 47, 50, 51, 58, 59, 64, 65, and homologs thereof.

(Original) 27. A polypeptide which binds IAP but does not cleave IAP, comprising Omi SA.

(Original) 28. An Omi serine protease for use in cleaving IAP.

(Original) 29. An OmiΔPDZ for cleaving IAP.

(Original) 30. A polypeptide molecule for cleaving an IAP comprising an amino acid sequence as set forth in $C1_{n1}$-R1-$C2_{n2}$-R2-$C3_{n3}$-R3-$C4_{n4}$, wherein:

(a) R1 is a serine;

(b) R2 is an amino acid residue selected from a group consisting of charged amino acid residues and aromatic amino acid residues;

(c) R3 is an amino acid residue selected from a group consisting of charged amino acid residues and polar amino acid residues; and,

(d) R1, R2 and R3 form a catalytic triad for cleavage of the IAP.

(Original) 31. The molecule of Claim 30, wherein R2 is an amino acid residue selected from a group consisting of histidine, lysine, arginine, phenylalanine, tyrosine, and tryptophan.

(Original) 32. The molecule of Claim 30, wherein R3 is an amino acid residue selected from a group consisting of aspartic acid, glutamic acid, lysine, histidine, and arginine.

(Original) 33. The polypeptide of Claim 30, wherein $C1_{n1}$, $C2_{n2}$, $C3_{n3}$, and $C4_{n4}$ are polypeptide chains.

(Original) 34. The polypeptide of Claim 33, wherein n1 is a number between 10 and 100.

(Original) 35. The polypeptide of Claim 33, wherein n2 is a number between 10 and 100.

(Original) 36. The polypeptide of Claim 33, wherein n3 is a number between 10 and 150.

(Original) 37. The polypeptide of Claim 33, wherein n4 is a number between 10 and 200.

(Original) 38. The molecule of Claim 33, wherein the $C1_{n1}$ chain is the N-terminal and has an AVPS motif sequence that operably couples to IAP.

(Original) 39. The molecule of Claim 33, wherein the $C4_{n4}$ chain is the C-terminal and has a hinge sequence and PDZ domain.

(Original) 40. The molecule of Claim 39, wherein the PDZ domain is removed.

(Original) 41. The molecule of Claim 30 wherein a $C1_{n1}$ polypeptide chain has an N-terminal location and comprises an amino acid sequence as set forth in SEQ ID NOs. 54 and 55.

(Original) 42. The polypeptide of Claim 30 operably enclosed in a liposome in an aqueous medium.

(Original) 43. A polypeptide molecule comprising an amino acid sequence as set forth in SEQ ID NOs. 54 and 55.

(Original) 44. A serine protease polypeptide molecule wherein the molecule is of the formula comprising $C1_{n1}$-R1-$C2_{n2}$-R2-$C3_{n3}$-R3-$C4_{n4}$, wherein:

(a) R1 is a serine;

(b) R2 is an amino acid residue selected from a group consisting of a charged amino acid residue and an aromatic amino acid residue;

(c) R3 is an amino acid residue selected from a group consisting of a charged amino acid residue and a polar amino acid residue;

(d) $C1_{n1}$, $C2_{n2}$, $C3_{n3}$, and $C4_{n4}$ are polypeptide chains;

(e) n1 is an amino acid residue number ranging between 10 and 100;

(f) n2 is an amino acid residue number ranging between 10 and 100;

(g) n3 is an amino acid residue number ranging between 10 and 150;

(h) n4 is an amino acid residue number ranging between 10 and 200; and,

(i) R1, R2 and R3 form a catalytic triad for cleavage of a polypeptide substrate.

(Original) 45. A polypeptide molecule comprising an amino acid sequence selected from the group consisting of SEQ ID NOs. 46, 47, and homologs thereof.

(Original) 46. A polypeptide molecule comprising an amino acid sequence selected from the group consisting of SEQ ID NOs. 48, 49 and homologs thereof.

(Original) 47. A polypeptide molecule comprising an amino acid sequence selected from the group consisting of SEQ ID NOs. 56, 57 and homologs thereof.

(Original) 48. A polypeptide molecule comprising an amino acid sequence selected from the group consisting of SEQ ID NOs. 60 through 63 and homologs thereof.

(Currently Amended) 49. A polypeptide molecule for inhibiting IAP cleavage comprising an amino acid sequence as set forth in $C1_{n1}$-R1-$C2_{n2}$-R2-$C3_{n3}$-R3-$C4_{n4}$, wherein:

(a) ~~R_1~~ R1 is an amino acid residue selected from a group consisting of an alanine, an arginine, an aspartic acid, an asparagine, a cysteine, a glutamic acid, a glutamine, a glycine, a histidine, an isoleucine, a leucine, a lysine, a methionine, a phenylalanine, a proline, a threonine, a tryptophan, a tyrosine, and a valine;

(b) ~~R_2~~ R2 is a histidine;

(c) ~~R_3~~ R3 is an aspartic acid; and,

(d) an AVPS moiety binds to IAP.

(Original) 50. An OmiΔPDZ expressed intra-cellularly by an OmiΔPDZ vector in a cell.

(Original) 51. A nucleic acid sequence, which expresses a polypeptide which cleaves IAP, wherein the nucleic acid sequence is selected from the group consisting of Omi family member nucleic acid sequences, degenerate variants of the Omi family member, and homologous sequences to the Omi family member.

(Currently Amended) 52. The nucleic acid sequence of Claim 51, wherein the sequence is selected from the group consisting of SEQ ID NOs. 1-41, and ~~homologes~~ homologous sequences thereof.

(Original) 53. The nucleic acid sequence of Claim 51, wherein the sequence is selected from the group consisting of Omi WT, OmiΔPDZ, OmiΔAVPS, Omi protease, Omi catalytic triad, and homologs thereof.

(Currently Amended) 54. A nucleic acid sequence which expresses isolated polypeptide for cleaving IAP, wherein the nucleic acid sequence is selected from the group consisting of SEQ ID NOs. 1-43, and ~~homologes~~ homologous sequences thereof.

(Currently Amended) 55. A nucleic acid sequence which expresses a polypeptide for cleaving IAP, wherein the nucleic acid sequence expresses a protease domain, selected from the group consisting of SEQ ID NOs. 44, 45,48 and 49, and ~~homologes~~ homologous sequences thereof.

(Currently Amended) 56. A nucleic acid sequence which expresses a polypeptide having increased protease activity comprising a polypeptide selected from the group consisting of SEQ ID NOs. 48, 49, 50, 56, 57, 58, 59, 60, 61, and ~~homologes~~ homologous sequences thereof.

(Currently Amended) 57. A nucleic acid sequence which expresses a polypeptide for binding to a BIR site on an IAP, comprising SEQ ID NO. 82 and ~~homologes~~ homologous sequences thereof.

(Original) 58. A nucleic acid sequence which expresses a polypeptide for cleaving IAP comprising a polypeptide selected from the group consisting of SEQ ID NOs. 44, 45, and homologous sequences thereof.

(Original) 59. A nucleic acid sequence, which expresses a polypeptide, which binds to IAP, but does not cleave IAP, selected from the group consisting of SEQ ID NOs. 4, 5, 9, 10, 20, 21, 28, and 29, and homologs thereof.

(Original) 60. A nucleic acid sequence which expresses a polypeptide which binds IAP but does not cleave IAP, comprising Omi SA.

(Original) 61. An expression vector comprising a nucleic acid that expresses a molecule for cleaving IAP selected from a group consisting of SEQ ID NOs.1-43, and homologous sequences thereof.

(Original) 62. The expression vector of Claim 61, wherein the expression vector is selected from a group consisting of a plasmid and an episome.

(Original) 63. The expression vector of Claim 61, wherein the expression vector comprises a replicating virus.

(Original) 64. The expression vector of Claim 61, wherein the expression vector is a pE721b vector.

(Original) 65. An Omi expression vector, comprising an Omi family nucleic acid sequence and a vector selected from the group consisting of eukaryotic vectors MSCV, Harvey murine sarcoma virus, pFastBac, pFastBac HT, pFastBac DUAL, pSFV, pTet-Splice, pEUK-C1, pPUR, pMAM, pMAMneo, pBI101, pBI121, pDR2, pCMVEBNA, YACneo, pSVK3, pSVL, pMSG, pCH110, pKK232-8, p3'SS, pBlueBacIII, pCDM8, pcDNA1, pZeoSV, pcDNA3, pREP4, pET21b, pCEP4, and pEBVHis vectors.

(Original) 66. A transfected cell comprising:

(a) an expression vector that expresses an Omi family member polypeptide; and,

(b) a promoter.

(Original) 67. The transfected cell of Claim 66, wherein the transfected cell is selected from the group consisting of an animal cell and a plant cell.

(Original) 68. The transfected cell of Claim 66, wherein the transfected cell is a tumor cell.

(Original) 69. The transfected cell of Claim 66, wherein the polypeptide is an OmiΔPDZ.

(Original) 70. The transfected cell of Claim 66, wherein the vector is selected from the group consisting of eukaryotic vectors MSCV, Harvey murine sarcoma virus, pFastBac, pFastBac HT, pFastBac DUAL, pSFV, pTet-Splice, pEUK-C1, pPUR, pMAM, pMAMneo, pBI101, pBI121, pDR2, pCMVEBNA, YACneo, pSVK3, pSVL, pMSG, pCH110, pKK232-8, p3'SS, pBlueBacIII, pCDM8, pcDNA1, pZeoSV, pcDNA3, pREP4, pET21b, pCEP4, and pEBVHis vectors.

(Original) 71. A pharmaceutical composition for treatment of a hyperproliferative disorder in an animal which comprises a pharmacologically acceptable carrier and a therapeutically effective amount of the liposomes containing Omi family member polypeptides of SEQ ID NOs. 44, 45, 48, 49, 52-57, 60-63, and 66-75.

(Original) 72. A method of treating the hyperproliferative disorder comprising administering an effective amount of the pharmacological composition of Claim 71 into an animal.

(Original) 73. A hybridization kit for detecting an Omi wild-type gene, wherein the kit comprises:

(a) a container; and,

(b) a nucleic acid molecule comprising a nucleotide molecule selected from a group consisting of Omi family nucleic acid sequences.

(Original) 74. A hybridization kit for detecting an Omi mutant gene, wherein the kit comprises:

(a) a container; and,

(b) a nucleic acid molecule comprising a molecule selected from a group consisting of SEQ ID NOs. 1-41, and homologous sequences thereof.

(Original) 75. A kit for detecting an Omi gene comprising:

(a) PCR primers spanning an Omi family gene, a positive control; and,

(b) sequencing products.

(Original) 76. A kit for detecting an Omi polypeptide, wherein the kit comprises:

(a) a container; and,

(b) an antibody derived from polypeptide selected from a group consisting of SEQ ID NOs. 44-77, and homologs thereof.

(Original) 77. An antibody which binds to the Omi serine.

(Original) 78. An antibody which binds to a protease.

(Original) 79. A mammalian cell consisting essentially of:

(a) a cell transfected by an Omi expression vector;

(b) the transfected cell producing an IAP-cleaving molecule selected from the group consisting of said IAP-cleaving molecules; and,

(c) a promoter controlling transcription and the quantity of production of said IAP-cleaving molecule.

(Original) 80. The mammalian cell of Claim 79, wherein, in the transfected cell, the expression vector is autonomously replicating.

(Original) 81. The mammalian cell of Claim 79, wherein said transfected cell is a human cell.

(Currently Amended) 82. A method of detecting and identifying an IAP-cleaving molecule comprising:

(a) binding an antibody directed against an antigen associated with the IAP-cleavage site on said IAP-cleaving molecule to a solid phase ~~adsorbent~~ absorbent surface;

(b) adding a specimen containing a plurality of unlabelled IAP-cleaving molecules;

(c) adding a plurality of labeled IAP-cleaving molecules;

(d) detecting the bound labeled IAP-cleaving molecules; and,

(e) calculating the amount of bound unlabeled IAP-cleaving molecules.

(Original) 83. The method of Claim 82, wherein the antibody is selected from the group consisting of a monoclonal antibody, a polyclonal antibody, and a recombinant antibody.

(Original) 84. The method of Claim 82, wherein the label is selected from the group consisting of a radiolabel, a luminescent label, and a colorimetric label.

(Original) 85. The method of Claim 82, wherein the antibody is selected of the group consisting of SEQ ID NOs. 44-77, and homologs thereof.

(Original) 86. An Omi expression vector, comprising an Omi family nucleic acid sequence selected from the group consisting of SEQ ID NOs. 1-41, and homologs thereof, and a vector selected from the group consisting of eukaryotic vectors MSCV, Harvey murine sarcoma virus, pFastBac, pFastBac HT, pFastBac DUAL, pSFV, pTet-Splice, pEUK-C1, pPUR, pMAM, pMAMneo, pBI101, pBI121, pDR2, pCMVEBNA, YACneo, pSVK3, pSVL, pMSG, pCH110,

pKK232-8, p3'SS, pBlueBacIII, pCDM8, pcDNA1, pZeoSV, pcDNA3, pREP4, pET21b, pCEP4, and pEBVHis vectors.